



ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

Public Health Assessment for

**QUENDALL TERMINALS
RENTON, KING COUNTY, WASHINGTON
EPA FACILITY ID: WAD980639215
SEPTEMBER 30, 2006**

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
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Agency for Toxic Substances and Disease Registry

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THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

Section 104 (i) (7) (A) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, states "...the term 'health assessment' shall include preliminary assessments of potential risks to human health posed by individual sites and facilities, based on such factors as the nature and extent of contamination, the existence of potential pathways of human exposure (including ground or surface water contamination, air emissions, and food chain contamination), the size and potential susceptibility of the community within the likely pathways of exposure, the comparison of expected human exposure levels to the short-term and long-term health effects associated with identified hazardous substances and any available recommended exposure or tolerance limits for such hazardous substances, and the comparison of existing morbidity and mortality data on diseases that may be associated with the observed levels of exposure. The Administrator of ATSDR shall use appropriate data, risk assessments, risk evaluations and studies available from the Administrator of EPA."

In accordance with the CERCLA section cited, ATSDR has conducted this health assessment on readily available site data. Additional public health assessments may be conducted for this site as more information becomes available to ATSDR.

The conclusions and recommendations presented in this public health assessment are the results of site-specific analyses and are not to be cited or quoted in other evaluations or public health assessments.

Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or the U.S. Department of Health and Human Services.

INITIAL RELEASE PUBLIC HEALTH ASSESSMENT

QUENDALL TERMINALS

RENTON, KING COUNTY, WASHINGTON

EPA FACILITY ID: WAD980639215

Prepared by:

Washington State Department Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

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Summary and Statement of Issues

The Washington State Department of Health (DOH) has prepared this health assessment at the request of the U.S. Environmental Protection Agency (EPA). The purpose of this health assessment is to evaluate the potential health hazard posed by contaminants in soil, lake sediment and groundwater sampling data at Quendall Terminals in King County, Renton, Washington. DOH prepares health assessments under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR).

Currently no completed human exposure pathways have been identified for the site. The environmental data from previous environmental investigations needs to be organized for completeness as the data varies significantly and there is limited laboratory quality assurance/quality control information available for the data.

Quendall Terminals poses an indeterminate public health hazard. The existing data need to be organized to document human exposure. Currently there is potential for human exposure to occur at the site. EPA has oversight for the Remedial Investigation and Feasibility Study (RI/FS) which will further characterize the nature and extent of contamination at Quendall Terminals. As environmental data become available, EPA should provide the data to DOH for evaluation of human health effects.

Background

The Washington State Department of Health (DOH) prepared this public health assessment under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). This health assessment is mandated by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. On September 14, 2005, EPA proposed to place Quendall Terminals on the National Priorities List (NPL) in accordance with Section 105 of CERCLA, 42 U.S.C. 9605. [2] The NPL is EPA's list of the Nation's most contaminated hazardous waste sites, also known as Superfund sites. ATSDR is required to conduct a public health assessment for all hazardous waste sites proposed for inclusion on the National Priorities List. On April 19, 2006, the U.S. Environmental Protection Agency (EPA) officially listed the Quendall Terminals site on the NPL.

The purpose of this assessment is to determine whether the site poses a public health threat as well as make recommendations and take appropriate actions based on that determination. While a risk assessment conducted under EPA's Remedial Investigation/Feasibility Study (RI/FS) process is used to support the selection of remedial measures at a site, the Public Health Assessment (PHA) provides the community with information on the site-specific public health implications. It identifies populations where further health actions or studies are needed. [3] Therefore, different assumptions and methods may be used that reflect the different purposes for risk assessments and public health assessments.

A. Site Description

Quendall Terminals is a 25-acre property located on the southeastern shore of Lake Washington at 4503 Lake Washington Boulevard North, in Renton, King County, Washington. The Barbee Mill property and May Creek border the site to the south. The former J.H. Baxter property (Port Quendall now owns) borders the site to the north. The Burlington Northern Santa Fe Railroad right-of-way borders to the east, and about 4,000 feet of Lake Washington shoreline borders to the west.

May Creek flows toward the southern end of the site along the Barbee Mill property. The site is relatively flat today due to filling and grading. The entire site has fill ranging from one foot to as much as 14 feet in places [1, 4]. The fill consists of silt, sand, gravel, wood, brick and glass.

B. Site Operations and History

The site was part of a homestead patented to Jeremiah Sullivan in 1874 and was deeded to James Coleman in 1876 [1, 2]. May Creek originally flowed through the middle of the site. The upland area of the site was occupied by a shingle mill prior to 1916. The site was later deeded to Peter Reilly in 1916. The lowering of Lake Washington in 1916 exposed more of the May Creek delta thus increasing the parcel size [1, 3].

The site operated as a coal tar refining plant from 1916 to 1969 by Republic Creosote Company. The name later changed to Reilly Tar and Chemical Corporation, which manufacturing creosote and other tar products. Tar was purchased from Seattle Gas Company on Lake Union and

shipped via rail or barged on Lake Washington to the site. The tar was pumped through transfer lines, which ran along two docks (T-dock and the southern pier dock) to two, 2-million gallon storage tanks in the tank farm area.

In 1971, the site was sold to Quendall Terminals, and the site has been used periodically for fuel storage and as a log sorting yard. Quendall Terminals is a joint venture formed by J.H. Baxter and Altino Properties (owners of Barbee Mill).

Currently, the northeast part of the site is used for log sorting and storage, while the southwest part is used for staging and storage for waterfront barge operations. All of the buildings except for the office building have been removed from the site. A series of settling ponds are located along the western edge for storm water management.

C. Regulatory History and Activities

In the 1970s the Washington State Department of Ecology and Municipality of Metropolitan Seattle (METRO) learned of possible contamination at the site [5]. Several investigations have been carried out on the site, starting in 1971 with the sale of the property [1, 4]. In 1984, the site was inspected and ranked by Ecology. The site was then proposed for inclusion on the EPA's National Priorities List (NPL), thereby making EPA the lead for site activities. In 1986, the site was removed from the proposed NPL sites. Since then Ecology has been providing oversight for the cleanup under the state's Model Toxics Control Act (MTCA).

In the early 1990s, Ecology conducted studies on offshore sediments at the site [6, 7, 8]. In 1993, Ecology negotiated an Agreed Order with Quendall Terminals [2]. As part of the Agreed Order, Quendall Terminals completed a remedial investigation [1]. In 1998, the Agreed Order was amended when the City of Renton and Vulcan Inc., expressed interest in purchasing the site. In 1999, the City of Renton submitted a draft Remedial Investigation and Focus Feasibility Study to Ecology [4]. However, the City of Renton and Vulcan Inc. declined the purchase and redevelopment option for the site. Ecology continued negotiations with Quendall Terminals to complete the Risk Assessment and Feasibility Study, in accordance with the 1983 Agreed Order. In late 2003, Ecology requested EPA to evaluate the site using the Hazard Ranking System (HRS). In late January 2005, Ecology requested that EPA take the lead for overseeing cleanup at the site. In September 2005, the site was proposed for inclusion on the NPL list. In April 2006, the site was added as an NPL site. Currently, EPA and Quendall Terminals are in negotiations.

D. Land Use and Natural Resources Information

Quendall Terminals was originally zoned for industrial use. In the late 1990s, the City of Renton later zoned this property and the surrounding properties as "Commercial Office Residential." Quendall Terminals is allowed to continue using the property as it is used; however, they may not change or expand the existing operation.

The site is located on the southeastern shore of Lake Washington, east of Seattle, Washington. The lake is approximately 28 km long and 65 m deep (87.6 km²) [9]. It is used for a variety of recreational, commercial, and industrial purposes. There are two swimming beaches located

within a half mile of the site. Lake Washington is an important sport and tribal fishery resource with several varieties of native and introduced fish species in the Lake Washington basin [9]. The lake is considered prime habitat for rearing of juvenile Chinook (a federally threatened species) and other salmon stocks. The Cedar River and May Creek enter Lake Washington within 2 miles of Quendall Terminals. The Cedar River supports the largest sockeye run in the contiguous United States.

The Washington Department of Fish and Wildlife (WDFW) and three Puget Sound Indian tribes (Muckleshoot, Suquamish, and Tulalip tribes) cooperatively managed Lake Washington sockeye salmon [10]. The annual spawning goal for Lake Washington is 350,000 sockeye salmon. When the run exceed this goal, the surplus fish are available for harvest by sport and Tribal fisheries [10]. As of August 4, 2006, the current count for sockeye return is about 466,000 fish.

E. Demographic Information

According to the 2000 census, King County had a population of 1,737,034 (U.S. Census Bureau 1990; 2000). Similarly, the 2000 census shows the population of Renton is approximately 50,052. Approximately 5,005 persons lived within a 1-mile radius of the site. The majority of people are white (~85%), but about 10% of the population in the area are comprised of Asian and Pacific Islanders (APIs). Studies have shown that APIs consume more fish than Caucasians. Therefore, potential implications for fish consumption exist from contaminated fish in the area. Figure 1 presents additional demographic information for residents within a 1-mile radius of Quendall Terminals site.

F. Site Visit

On April 14, 2006, a site visit was conducted by DOH and EPA staff, and Robert Cugini of Quendall Terminals.

The following observations were made during the physical inspection of the site:

- The site is very easy to access from the road on the eastern side or from the lake via boat.
- Illegal dumping of household products occurs at this site.
- A series of settling ponds are located on the northwestern of the site presumably to control stormwater runoff.
- The log sorting operation has disturbed and mixed surface and sub-surface soil in the north central and eastern portions of the site.
- The southwest corner of the site is used for loading, off-loading barges, and storage of poles and other equipment.

Environmental Contamination

A. On-Site Contamination

Environmental investigations of the Quendall Terminals site have identified polycyclic aromatic hydrocarbons (PAHs), naphthalene, benzene, toluene, ethylbenzene, and xylene (BTEX) and dense non-aqueous phase liquids (DNAPL) associated with coal tar, pitch, creosote, and other tar distillates contamination in subsurface soils, groundwater, and freshwater sediments. Potential contamination sources include historical chemical storage tanks areas, spill areas and loading areas. Much of the existing contaminant data are from 1980s and 1990s, and are poorly organized. EPA has questioned the quality of the data. Recently, EPA has required Quendall Terminals to validate all the data and compile it in one place electronically.

Soils

Although a number of environmental investigations have been conducted at the Quendall Terminals site, the data are mainly from depth and have shown soil contamination. Very few surface samples are evident.

Groundwater

Several groundwater monitoring wells were installed on-site during previous investigations conducted. Naphthalene, PAHs, BTEX and DNAPL have been detected in on-site monitoring wells.

B. Off-Site Contamination

Surrounding property has been, and is currently being, evaluated for contamination as part of the redevelopment project in the area. The former J.H. Baxter property that borders the Quendall Terminals to the north has undergone environmental cleanup and is now the future site of the Seattle Seahawks football team headquarters. The sawmill on the Barbee Mill property that borders the site to the south has been dismantled and the site is slated for redevelopment.

Pathways Analysis/Public Health Implications

In order to determine if exposure to contaminants from the Quendall Terminals site has occurred, exposure pathways are evaluated in this section. Completed exposure pathways contain the five listed elements below and indicate that exposure to a contaminant has occurred in the past, is currently occurring, or may occur in the future. An exposure pathway contains the following elements:

- A source of contamination.
- Transport of contamination through an environmental medium (soil, water, air).
- A point at which humans may be exposed.

- A route of human exposure (ingestion, inhalation, or dermal contact).
- A receptor population (on-site workers or residents).

Potential exposure pathways indicate that contaminant exposure may have occurred in the past, could presently be occurring, or could possibly occur in the future. However, an exposure pathway is removed from consideration if one of the five elements is missing and will never be present.

A. Completed Exposure Pathways

Presently, no completed human exposure pathways have been identified for the site. However, the environmental data from previous environmental investigations needs to be organized for completeness as the data varies significantly and there is limited laboratory quality assurance/quality control information available for the data.

B. Potential Exposure Pathways

Several potential human exposure pathways exist at the site from contaminants present in surface soil, subsurface soil, groundwater, fish, and sediments. Potential, human exposure pathways that may have occurred in the past, are currently occurring, or could occur in the future at the site are listed in Table 1.

Surface Soil Pathway

Potential routes of exposure are ingestion, dermal contact and inhalation of wind-born dust by on-site workers or remedial workers from contaminated surface soil. The extent of surface soil contamination is presently unknown. Characterization of surface soils (0 - 3 inches in depth) at the site is necessary to assess the public health implications of the surface soil pathway. This represents a data gap.

Subsurface Soil Pathway

Potential routes of exposure are ingestion, dermal contact and inhalation of wind-born dust by on-site workers or remedial workers from contaminated subsurface soil. During excavation or remediation activities, soil disturbing activities may lead to contaminated subsurface soil being exposed. Subsurface soil investigations have been conducted to determine the extent of contamination on-site. However, since EPA took over the management of this site, they requested Quendall Terminals validate all the data and compile it in one place electronically.

Groundwater Pathway

Potential routes of exposure to contaminated groundwater are ingestion, inhalation, and dermal contact. The number of wells located within a 1-mile radius of Quendall Terminals that could be used as a source of drinking water or for occupational purposes is presently unknown. It is necessary to determine the existence of wells to understand the public health implications of the groundwater pathway.

Surface Water Pathway

Due to the proximity of Lake Washington to the site, surface water runoff into the lake presents a potential for contamination. Potential routes of exposure to contaminated surface water include accidental ingestion, and dermal contact while swimming in Lake Washington.

Sediments Pathway

Surface water runoff is a primary transport mechanism for contaminated soils into surface water and sediments. Potential routes of exposure from contaminated sediments may include dermal contact by remedial workers during site cleanup activities and recreational beach users.

Fish Ingestion Pathway

A potential route of exposure from contaminated fish is ingestion by recreational anglers, subsistent and tribal fisher. Past, current, and future exposure from ingestion of contaminated fish harvested from Lake Washington is possible. An existing fish advisory is in place for Lake Washington northern pikeminnow, yellow perch, cutthroat trout, largemouth bass, and smallmouth bass due to elevated mercury and polychlorinated biphenyl (PCB) levels [9].

Table 1 - POTENTIAL EXPOSURE PATHWAYS

Pathway Name	Environmental Pathway Elements					Time
	Source	Environmental Media	Point of Exposure	Route of Exposure	Exposed Population	
Surface Soils	Treated wood transfer areas.	Surface Soils	On-site soil	Ingestion Inhalation Dermal Contact	On-site & Remedial Workers	Past Present Future
Subsurface Soils	chemical spills and leaks areas	Subsurface Soils	Historic Process and Storage Areas	Ingestion Inhalation Dermal Contact	Remedial Workers	Future
Sediments	chemical spills and transfer areas	Sediment	Nearby Public Beaches & site shoreline	Ingestion Dermal Contact	Recreational Users & Remedial Workers	Past Present Future
Groundwater	chemical spills, storage and transfer areas	Groundwater	Historic Process and Storage Areas	Dermal Contact Ingestion Inhalation	Industrial Users	Past Present Future
Surface Water	chemical spills and transfer areas	Surface Water	Lake Washington	Ingestion Dermal Contact	Recreational Users	Past Present Future
Fish	chemical spills and transfer areas	Fish Tissue	Lake Washington	Ingestion	Recreational & Subsistence Users	Past Present Future

Discussion

A. Contaminants of Concern

Past soil sampling revealed BTEX PAHs etc. at various depths as well as DNAPL. Very few samples were taken from the surface. The data is currently not well organized. Many samples are old and validity is unknown. These issues render available environmental sampling results unsuitable for determining contaminants of concern and for evaluating human exposures. Since EPA took over the management of this site, they requested Quendall Terminals validate all the data and compile it in one place electronically. Consequently, contaminants of concern will, hopefully, be addressed in the public release draft of this health assessment.

Chemical Specific Information

A. Toxicological Evaluation

Presently completed human exposure pathways have not been identified at the site. The environmental data from previous environmental investigations needs to be organized for completeness as the data varies significantly and there is limited laboratory quality assurance/quality control information available for the data. Since EPA took over the management of this site, they requested Quendall Terminals validate all the data and compile it in one place electronically. Consequently, the toxicological evaluation will be addressed in the public release draft of this health assessment.

B. Health Outcome Data Evaluation

Currently no health outcome data have been evaluated for areas adjacent to the Quendall Terminals site. There are no known completed human exposure pathways or community health concerns documented alleging health effects from exposure to contaminants present at this site.

Community Health Concerns

DOH normally identifies community health concerns through meetings or correspondence with community members, federal, state and local officials. Some of this information is gathered from site personnel and review of site documents, including record of decisions (RODs) and Community Relations Plans. DOH is planning to meet with representatives of the Muckleshoot, Suquamish, and Tulalip tribes to discuss tribal concerns about current and or future use of Lake Washington as a source for harvesting fish. DOH will compile any concerns that the community may have regarding site-related contamination associated with Quendall Terminal and Lake Washington in future releases of this public health assessment.

Children's Health Concerns

The unique vulnerabilities of infants and children demand special attention in communities that have contamination of their water, food, soil, or air. The potential for exposure and subsequent adverse health effects often increases for younger children compared with older children or adults. ATSDR and DOH recognize that children are susceptible to developmental toxicity that can occur at levels much lower than those causing other types of toxicity.

Conclusions

An *indeterminate public health hazard* exists for Quendall Terminals. Existing data are not sufficient for evaluating human exposure. A potential for human exposure exists at the site, but existing data are not sufficient for evaluating potential exposures.

Recommendations

1. Quendall Terminals validate all the environmental data and compile it in one place electronically.
2. Further characterize the extent of surface soil contamination within Quendall Terminals.
3. Sample and analyze resident fish for site related contamination.
4. Identify drinking water wells within one mile of the site.

Public Health Action Plan

The Public Health Action Plan (PHAP) for Quendall Terminals identifies actions to be taken by DOH and other parties subsequent to the completion of this preliminary public health assessment. The purpose of the PHAP is to ensure that this public health assessment not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment.

1. EPA has oversight for the RI/FS, which will further characterize the nature and extent of contamination at Quendall Terminals. As environmental data becomes available, EPA will provide the data to DOH for evaluation of human health effects.
2. EPA is presently planning additional sampling as part of the on-going Remedial Investigation and Feasibility Study (RI/FS) for Quendall Terminals that should address these data gaps.
3. EPA is presently planning fish sampling as part of the on-going RI/FS for Quendall Terminals that should address this data gap.

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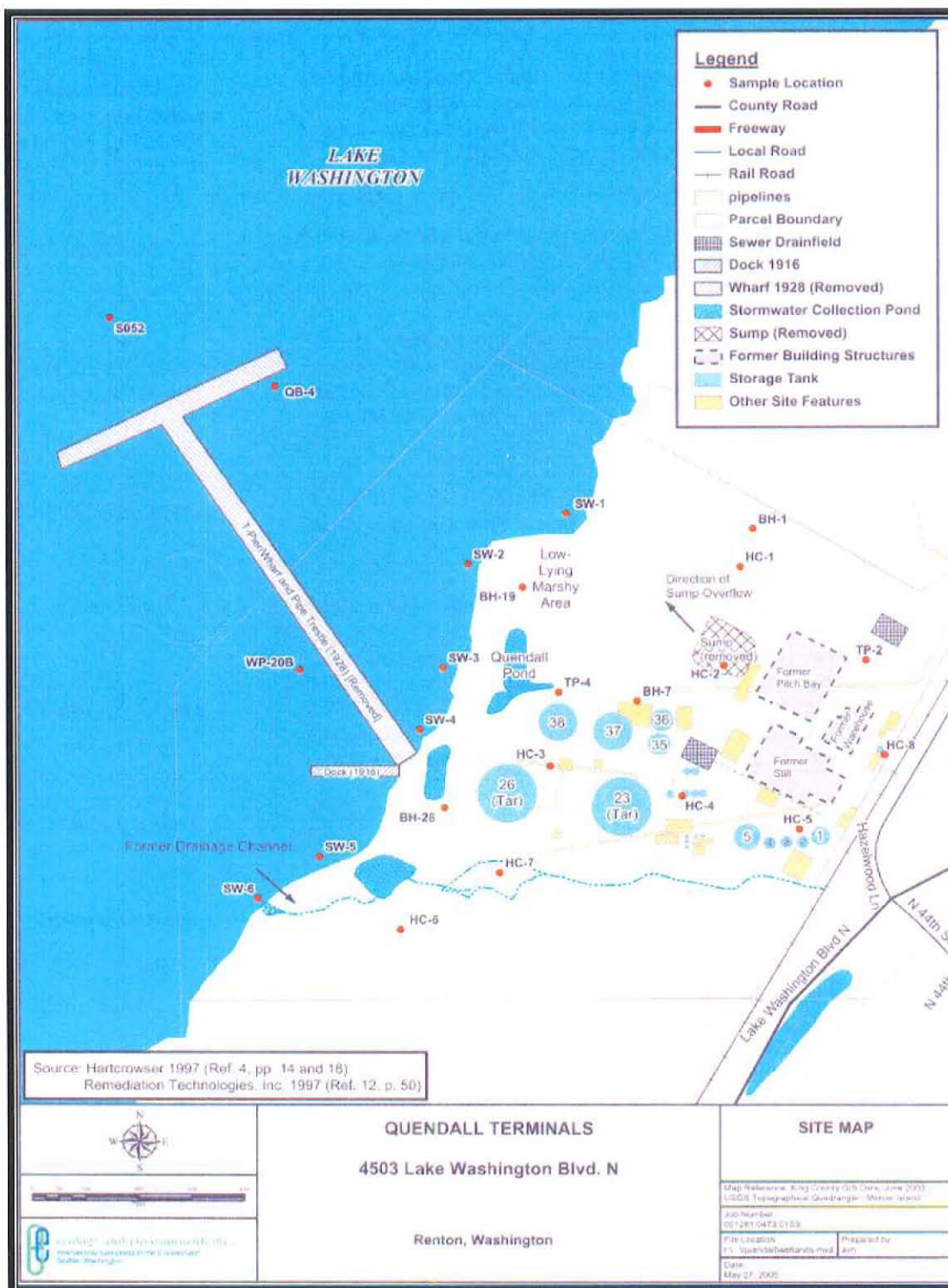
The map shows the Lake Washington Boulevard area in Seattle. The proposed bridge alignment is highlighted in red, crossing the lake. Key streets shown include SE 58th St, SE 59th St, SE 60th St, SE 61st St, SE 62nd St, SE 63rd St, SE 64th St, SE 65th St, SE 66th St, SE 67th St, SE 68th St, SE 69th St, SE 70th St, SE 71st St, SE 72nd St, SE 73rd St, SE 74th St, SE 75th St, SE 76th St, SE 77th St, SE 78th St, SE 79th St, SE 80th St, SE 81st St, SE 82nd St, SE 83rd St, SE 84th St, SE 85th St, SE 86th St, SE 87th St, SE 88th St, SE 89th St, SE 90th St, SE 91st St, SE 92nd St, SE 93rd St, SE 94th St, SE 95th St, SE 96th St, SE 97th St, SE 98th St, SE 99th St, SE 100th St. The map also shows the Lake Washington Boulevard bridge and the Lake Washington Ship Canal. A scale bar indicates 0 to 2125 feet.

Total Population	5005
White	4232
Black	73
American Indian, Eskimo, Aleut	20
Asian or Pacific Islander	503
Other Race	30
Hispanic Origin	143
Children Aged 6 and Younger	416
Adults Aged 65 and Older	534
Females Aged 15 - 44	1005
Total Aged over 18	3898
Total Aged under 18	1108
Total Housing Units	2127



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Figure 2. Quendall Terminals Site Map - Renton, King County, Washington.



Glossary

Agency for Toxic Substances and Disease Registry (ATSDR)	The principal federal public health agency involved with hazardous waste issues, responsible for preventing or reducing the harmful effects of exposure to hazardous substances on human health and quality of life. ATSDR is part of the U.S. Department of Health and Human Services.
Aquifer	An underground formation composed of materials such as sand, soil, or gravel that can store and/or supply groundwater to wells and springs.
Cancer Risk Evaluation Guide (CREG)	The concentration of a chemical in air, soil or water that is expected to cause no more than one excess cancer in a million persons exposed over a lifetime. The CREG is a <i>comparison value</i> used to select contaminants of potential health concern and is based on the <i>cancer slope factor</i> (CSF).
Cancer Slope Factor	A number assigned to a cancer causing chemical that is used to estimate its ability to cause cancer in humans.
Carcinogen	Any substance that causes cancer.
Comparison value	Calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed people. The CV is used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process.
Contaminant	A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.
Dermal Contact	Contact with (touching) the skin (see route of exposure).
Dose (for chemicals that are not radioactive)	The amount of a substance to which a person is exposed over some time period. Dose is a measurement of exposure. Dose is often expressed as milligram (amount) per kilogram (a measure of body weight) per day (a measure of time) when people eat or drink contaminated water, food, or soil. In general, the greater the dose, the greater the likelihood of an effect. An "exposure dose" is how much of a substance is encountered in the environment. An "absorbed dose" is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.
Environmental Media Evaluation Guide (EMEG)	A concentration in air, soil, or water below which adverse non-cancer health effects are not expected to occur. The EMEG is a <i>comparison value</i> used to select contaminants of potential health concern and is based on ATSDR's <i>minimal risk level</i> (MRL).


Environmental Protection Agency (EPA)	United States Environmental Protection Agency.
Exposure	Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [acute exposure], of intermediate duration, or long-term [chronic exposure].
Groundwater	Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with surface water].
Hazardous substance	Any material that poses a threat to public health and/or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive.
Ingestion	The act of swallowing something through eating, drinking, or mouthing objects. A hazardous substance can enter the body this way [see route of exposure].
Ingestion rate	The amount of an environmental medium that could be ingested typically on a daily basis. Units for IR are usually liter/day for water, and mg/day for soil.
Inhalation	The act of breathing. A hazardous substance can enter the body this way [see route of exposure].
Inorganic	Compounds composed of mineral materials, including elemental salts and metals such as iron, aluminum, mercury, and zinc.
Lowest Observed Adverse Effect Level (LOAEL)	The lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals.
Maximum Contaminant Level (MCL)	A drinking water regulation established by the federal Safe Drinking Water Act. It is the maximum permissible concentration of a contaminant in water that is delivered to the free flowing outlet of the ultimate user of a public water system. MCLs are enforceable standards.
Media	Soil, water, air, plants, animals, or any other part of the environment that can contain contaminants.

Minimal Risk Level (MRL)	An ATSDR estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), noncancerous effects. MRLs are calculated for a route of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs should not be used as predictors of harmful (adverse) health effects [see reference dose].
Model Toxics Control Act (MTCA)	The hazardous waste cleanup law for Washington State.
No apparent public health hazard	A category used in ATSDR's public health assessments for sites where human exposure to contaminated media might be occurring, might have occurred in the past, or might occur in the future, but where the exposure is not expected to cause any harmful health effects.
No Observed Adverse Effect Level (NOAEL)	The highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals.
Oral Reference Dose (RfD)	An amount of chemical ingested into the body (i.e., dose) below which health effects are not expected. RfDs are published by EPA.
Organic	Compounds composed of carbon, including materials such as solvents, oils, and pesticides that are not easily dissolved in water.
Parts per billion (ppb)/Parts per million (ppm)	Units commonly used to express low concentrations of contaminants. For example, 1 ounce of trichloroethylene (TCE) in 1 million ounces of water is 1 ppm. 1 ounce of TCE in 1 billion ounces of water is 1 ppb. If one drop of TCE is mixed in a competition size swimming pool, the water will contain about 1 ppb of TCE.
Plume	A volume of a substance that moves from its source to places farther away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.
Reference Dose Media Evaluation Guide (RMEG)	A concentration in air, soil, or water below which adverse non-cancer health effects are not expected to occur. The RMEG is a <i>comparison value</i> used to select contaminants of potential health concern and is based on EPA's oral reference dose (RfD).
Route of exposure	The way people come into contact with a hazardous substance. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], or contact with the skin [dermal contact].

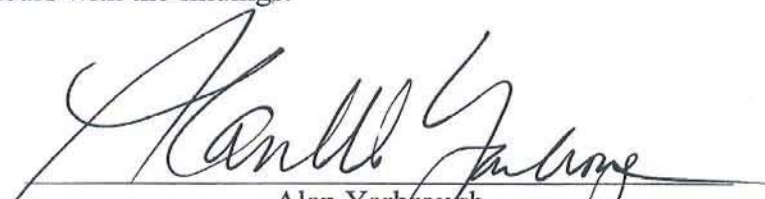
Surface Water	Water on the surface of the earth, such as in lakes, rivers, streams, ponds, and springs [compare with groundwater].
Volatile organic compound (VOC)	Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

Certification

This Quendall Terminals Health Assessment was prepared by the Washington State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health assessment was begun. Editorial review was completed by the Cooperative Agreement partner.


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The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health assessment and concurs with the findings.


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